

REMARKS

Applicant requests favorable consideration and allowance of the subject application in view of the preceding amendments, the remarks set forth in the July 29, 2002 Amendment After Final Rejection and the following remarks.

Initially, Applicant's representatives would like to thank Examiner Kim for the productive and cordial personal Interview of October 1, 2002. The substance of the interview will be discussed in more detail below.

Claims 11, 12, 14-16, 18-20, 22, and 24-42 are presented for consideration. Claims 11, 18, 27, and 28 are independent.

Claims 11, 18, 27, and 28 have been amended pursuant to the changes proposed during the Interview. Claims 34-42 have been added to provide an additional scope of protection. Support for the amendments and the new claims can be found in the original application as filed. No new matter has been added.

In the Office Action dated February 28, 2002, as affirmed by the Advisory Action dated August 8, 2002, claims 11 and 12 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the Moslehi patent. Also, claims 14 and 15 have been rejected under 35 U.S.C. § 103(a) as unpatentable over the Moslehi patent in view of the Tatsuno et al. patent; claim 16 has been rejected under 35 U.S.C. § 103(a) as unpatentable over the Moslehi patent in view of the Sutton et al. patent; claims 18-20 and 26-29 have been rejected under 35 U.S.C. § 103(a) as unpatentable over the Kim et al. patent in view of the Moslehi patent; claims 22 and 26 have been rejected under 35 U.S.C. § 103(a) as unpatentable over the Kim et al. patent in view of the Moslehi patent, and further in view of the Tatsuno et al. patent; and claims 24-26 have been

rejected under 35 U.S.C. § 103(a) as unpatentable over the Kim et al. patent in view of the Moslehi patent, and further in view of the Sutton et al. patent.

As discussed in the interview, in one aspect of the present invention, claim 11 recites an optical system for use in a projection exposure apparatus. The system includes a plurality of lenses that cause birefringence and at least one optical element for substantially eliminating the birefringence caused by the plurality of lenses.

In another aspect of the invention, claim 18 recites a projection exposure apparatus including an illumination system and a projection optical system. The illumination system illuminates a reticle with light. The projection optical system projects a pattern of the reticles onto a wafer. The projection optical system includes a plurality of lenses that cause birefringence, and at least one optical element for substantially eliminating the birefringence caused by the plurality of lenses.

In another aspect of the invention, claim 27 recites an optical system for use in a step-and-scan type projection exposure apparatus. The optical system includes a plurality of optical elements, each causing birefringence. The plurality of optical elements are arranged so that the birefringence of the optical system as a whole is substantially eliminated.

In still another aspect of the invention, claim 28 recites a step-and-scan type projection exposure apparatus including an illumination system and a projection system. The illumination system illuminates a reticle with light and the projection system projects a pattern of the reticle onto a wafer. The plurality of optical elements are arranged so that the birefringence of the optical system as a whole is substantially eliminated.

As such, in each aspect of the present invention, birefringence caused by either a plurality of lenses (claims 11 and 18) or a plurality of optical elements (claims 27 and 28) is eliminated or substantially eliminated. Applicants submit that the cited art does not teach or suggest such features of the present invention, as recited in independent claims 11, 18, 27, and 28.

The Moslehi patent is directed to a three-crystal temperature-compensated reference interferometer. More specifically, the Moslehi patent is directed to a method of stabilization of a wavelength of an optical source and teaches a thermally-compensated reference interferometer that detects phase differences resulting from fluctuations in the wavelength of the optical source and then adjusts the optical source to eliminate the fluctuations in wavelength. The interferometer of the Moslehi patent uses three birefringence crystals 34, 36, 38 arranged to function as a quarter-wave plate. As discussed at the Interview, a quarter-wave plate, by definition, introduces a phase difference of 1/4 cycle between the ordinary and extraordinary components of the light passing through it. However, the present invention, as recited in each of the independent claims, **eliminates** or substantially eliminates such a phase difference. Applicant asserts, therefore, that the Moslehi patent does not teach or suggest the elimination of a birefringence caused by either a plurality of lenses, as recited in independent claims 11 and 18 or a plurality of optical elements, as recited in independent claims 27 and 28.

As conceded in the Office Action, the Kim et al. patent “does not disclose the birefringence correcting element for correcting birefringence of the projection optical system.” As such, Applicant asserts that Kim et al. adds nothing to remedy the deficiencies discussed above with respect to the Moslehi patent.

Applicant understands the Tatsuno et al. patent and the Sutton et al. patent to be cited merely for teaching various features of the dependent claims. Applicant asserts that neither the Tatsuno et al. patent nor the Sutton et al. patent remedy the deficiencies discussed above with respect to the Moslehi patent.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claims 1, 2, 14, and 22, should be deemed allowable over the cited art, whether that art is taken individually or in combination.

The dependent claims also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicants further submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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APPENDIX A

IN THE CLAIMS

11. (Amended) An optical system for use in a projection exposure apparatus, said optical system comprising:

a plurality of lenses that cause [having] birefringence; and

at least one optical element for substantially eliminating [correcting] the birefringence caused by [of] said plurality of lenses.

18. (Amended) A projection exposure apparatus comprising:

an illumination system for illuminating a reticle with light; and

a projection optical system for projecting a pattern of the reticle onto a wafer, said projection optical system including a plurality of lenses that cause [having] birefringence, and at least one optical element for substantially eliminating [correcting] the birefringence caused by [of] said plurality of lenses.

27. (Amended) An optical system for use in a step-and-scan type projection exposure apparatus, said optical system comprising:

a plurality of optical elements each causing [having] birefringence, said plurality of optical elements being arranged so that the birefringence of the optical system as a whole is substantially eliminated [corrected as a whole].

28. (Amended) A step-and-scan type projection exposure apparatus comprising:

an illumination system for illuminating a reticle with light; and

a projection [optical] system for projecting a pattern of the reticle onto a wafer, said projection [optical] system having a plurality of optical elements each causing [having] birefringence, and said plurality of optical elements being arranged so that the birefringence of the optical system as a whole is substantially eliminated [corrected as a whole].